

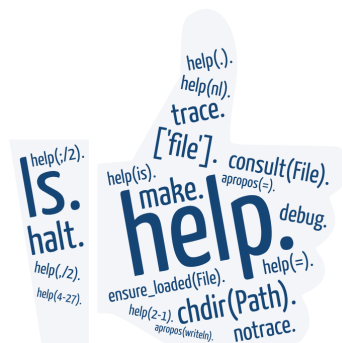
Dr.-Ing. Sascha Klüppelholz

Type in the following Prolog program.

How do these changes effect the result and/or the order in which solutions are found?

and reconsult the program. Query it with “perm3(X).” and “perm3(L,a,b).”.

f) Execute and understand the following commands. Read the respective paragraph of the manual. For next week, please read Sections 2.1 (Getting started quickly) and 4.27 (Arithmetic).

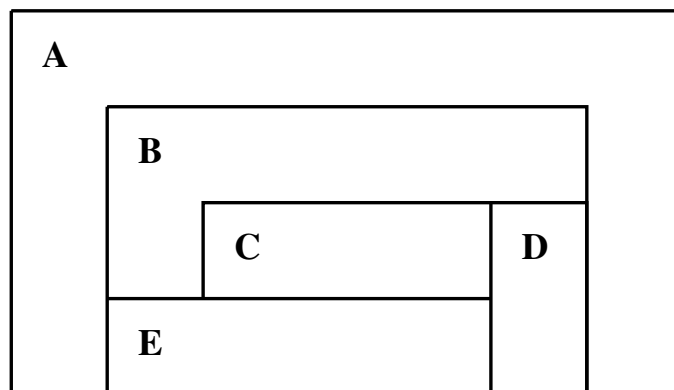


### Exercise 0.2 [Four colors]

Let  $G = (V, E)$  be a graph, where  $V$  is a finite set of nodes and  $E \subseteq V \times V$  the edge relation. A coloring of  $G$  is a total function  $\text{col} : V \rightarrow \text{Colors}$  that assigns a color to each of the nodes such that neighboring nodes carry different colors, i.e.,  $\text{col}(v_1) = \text{col}(v_2)$  implies  $(v_1, v_2) \notin E$ .

The goal of this exercise is to write a Prolog program that allows for computing all colorings of a given graph  $G$  with four colors.

- Define the four colors red, blue, yellow and green as facts `color/1` in your program.
- Define the predicate `coloring(A,B)` that evaluates to true if `color(A)` is different from `color(B)`.
- Encode the following map into the predicate `graphcolor/5`.



Your program should be the conjunction of sub-goals `coloring(X,Y)` for all nodes  $X, Y \in E$  and should start like this: `graphcolor(A,B,C,D,E) :- coloring(A,B), coloring(A,E), ...`

- Is there a solution for which A and C have different colors? Find this out using the following query: `“graphcolor(A,B,C,D,E), A \= C.”`
- Compute all possible four-colorings of the map above using the query `“graphcolor(A,B,C,D,E).”`. How many solutions are there?